UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

SEP 6 - 2018

Mary Abrams
Field Supervisor
Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Service
300 Ala Moana Blvd
Honolulu, HI 96850

Dear Ms. Abrams:

The purpose of this letter is to request the U.S. Fish and Wildlife Service's (USFWS) written concurrence, under Section 7 of the Endangered Species Act (ESA) and 50 CFR Section 402.13(a), with the U.S. Environmental Protection Agency (EPA) Region 9's determination on the possible effects of approval under Section 303(c)(3) of the Clean Water Act (CWA) of water quality standards (WQS) by the Commonwealth of the Northern Mariana Islands (CNMI) Bureau of Environmental and Coastal Quality (BECQ).

BECQ revised their ammonia, cadmium, and selenium water quality standards applicable to all freshwater in CNMI. Their water quality standards were public noticed on May 25, 2018 and a public hearing was held on July 13, 2018. The water quality standards were adopted by CNMI on August 28, 2018 and transmitted to EPA in a letter dated September 5, 2018.

BECQ previously adopted freshwater water quality standards for acrolein, carbaryl, diazinon, nonylphenol, and tributyltin on June 11, 2014. EPA approved the acrolein, carbaryl, diazinon, nonylphenol, and tributyltin water quality standards on May 1, 2015. EPA had previously initiated consultation on these five parameters but ESA consultation had not been concluded. As a result, the analysis of these parameters has been included in the enclosed Biological Evaluation (BE).

The BE documents the EPA's analysis of the effects of approving the water quality standards action on listed species under USFWS jurisdiction. The EPA has determined that approval of the water quality standards may affect, but is not likely to adversely affect threatened or endangered species. This conclusion is based on the effects on listed species which are expected to be discountable or insignificant.

The EPA is requesting USFWS's concurrence with our "may affect, but not likely to adversely affect" determination, in accordance with the procedures outlined in the Memorandum of

Agreement Between the Environmental Protection Agency, Fish and Wildlife Service, and National Marine Fisheries Service regarding Enhanced Coordination Under the Clean Water Act and Endangered Species Act, dated February 22, 2001. If you have any questions, please contact Nicole Tachiki of my staff at (415) 972-3161 or tachiki.nicole@epa.gov.

Sincerely,

Janet Hashimoto

Janet Hashimoto, Chief
Water Quality Assessment Section

Enclosure

cc: Tyler Willsey, USFWS

Biological Evaluation of the Commonwealth of the Northern Mariana's Water Quality Standards for Ammonia, Cadmium, Selenium, Acrolein, Carbaryl, Diazinon, Nonylphenol and Tributyltin

Prepared by:

U.S. Environmental Protection Agency
Region 9
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2018

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I. Introduction

This Biological Evaluation (BE) analyzes the U.S. Environmental Protection Agency (EPA) actions on the Commonwealth of the Northern Mariana Islands (CNMI)(Territory) Bureau of Environmental and Coastal Quality (BECQ) water quality standards. BECQ adopted freshwater water quality standards for ammonia, cadmium, and selenium. EPA is submitting this BE as part of a consultation under the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.). The scope of the consultation includes EPA's action on BECQ's adoption of freshwater ammonia, cadmium, and selenium standards.

The scope of this BE also includes EPA's previous approval of freshwater standards for nonylphenol, tributyltin, carbaryl, diazinon and acrolein adopted by CNMI on June 11, 2014 and approved by EPA on May 1, 2015. EPA had previously initiated consultation with the U.S. Fish and Wildlife Service (USFWS) on these parameters, but ESA consultation has not been concluded.

This BE addresses the potential impacts of ammonia, cadmium, selenium, acrolein, carbaryl, diazinon, nonylphenol, and tributyltin to listed species under the jurisdiction of USFWS in the area affected by the federal action, pursuant to Section 7 of the ESA and 50 CFR Section 402.13(a).

II. Description of Action

BECQ has submitted a package to adopt water quality standards to protect aquatic life from acute and chronic exposure to ammonia, cadmium, and selenium for all commonwealth or state waters. The parameters from the 2015 standards action include adopted WQS for acrolein, carbaryl, diazinon, nonylphenol, and tributyltin standards which all apply to both fresh and saltwater environments.

Water quality standards are not self-implementing, meaning other programs or authorities must be used to achieve water quality standards. For example, water quality standards can be used by the state to assess waterbodies or in writing pollutant discharge permits. Complete descriptions of the national criteria can be found on the EPA website (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table) and include properties of the pollutant, how the pollutant interacts in the environment, acute and chronic effects on species, criterion calculations, data used to set criterion levels, and more. Below is a summary of the pollutants CNMI plans to adopt.

A. <u>Ammonia</u>

Ammonia is one of several forms of nitrogen that exist in aquatic environments. Unlike other forms of nitrogen, which can cause nutrient over-enrichment of a water body at elevated concentrations and indirect effects on aquatic life, ammonia causes direct toxic effects on aquatic life. Ammonia is produced for commercial fertilizers and other industrial applications. Natural sources of ammonia include the decomposition or breakdown of organic waste matter, gas exchange with the atmosphere, forest fires, animal and human waste, and nitrogen fixation processes. Ammonia can enter the aquatic environment via direct means such as municipal effluent discharges and the excretion of nitrogenous wastes from animals, and indirect means such as nitrogen fixation, air deposition, and runoff from agricultural lands.

CNMI BECQ adopted EPA's 2013 national recommended ambient water quality criteria for ammonia, which applies to freshwater waterbodies. In April 2013, EPA finalized updated ammonia criteria considering the latest toxicity information for freshwater species, including unionid mussels and gill-breathing snails. The most recent literature search covered the period from 1985 through October 2012. These criteria incorporate scientific views received on the draft 2009 criteria and supersede the 1999 criteria, which was based on salmonid fish toxicity for the acute criterion and bluegill sunfish early life stage toxicity for the chronic criterion. The acute and chronic toxicity data used to update the criteria were collected via literature searches of EPA's ECOTOX database, EPA's Ambient Aquatic Life Water Quality Criteria for Ammonia (U.S. EPA 1985, 1998, 1999), and data provided by the USFWS and NOAA National Marine Fisheries Service (NMFS), and EPA regional and field offices. The new criteria are based on robust toxicity data available for 69 genera (acute) and 16 genera (chronic) and are more stringent than previously recommended criteria. Freshwater invertebrates in the Phylum Mollusca, particularly freshwater mussels in the family Unionidae, freshwater clams, and some non-pulmonate snails, are predominantly the most sensitive species for which the criteria protect (USEPA, 2013). Table 1 shows the magnitude, duration and frequency of the new criteria compared to the previous criteria CNMI had in place.

Table 1. Comparison of past and current EPA-recommended aquatic life water quality criteria magnitudes for ammonia. Criteria magnitudes are expressed as total ammonia nitrogen (mg TAN/L) at pH 7 and 20°C

Criterion Duration	1999 Criteria	2009 Draft Updated Criteria	2013 Final Updated Criteria
Acute (1-hour average)	24	19	17
Chronic (30-day rolling average)	4.5*	0.91*	1.9*
*Not to exceed 2.5 times the criterion continuous concentrations as a 4-day average within a 30-day period.			
Criteria frequency: Not to be exceeded more than once in three years on average.			

B. Cadmium

Cadmium is a naturally occurring metal found in mineral deposits and is distributed widely at low concentrations in the environment. Cadmium's primary industrial uses are for the manufacturer of batteries, pigments, plastic stabilizers, metal coatings, alloys and electronics. Recently, cadmium has been used in manufacturing nanoparticles for use in solar cells and color displays. Cadmium enters the environment by natural and human processes. Human sources, such as mining and urban processes, are responsible for contributing approximately 90 percent of the cadmium found in surface waters. None of the monitoring data for any of the permitted dischargers on CNMI reveal any effluent levels of cadmium. Acute exposure causes increased mortality in aquatic organisms. Chronic exposure leads to adverse effects on growth, reproduction, immune and endocrine systems, development and behavior in aquatic organisms (USEPA, 2016).

CNMI BECQ adopted EPA's 2016 national recommended aquatic life ambient water quality criteria for cadmium in order to reflect the latest scientific information. EPA published the original national recommended cadmium aquatic life criteria in 1980 with subsequent revisions. In 1985, acute toxicity values were lowered to better protect the commercially and recreationally important rainbow trout. In 2001, criteria were developed for dissolved cadmium, instead of total recoverable cadmium, to more accurately account for bioavailability and reflect the latest EPA policy for metals risk assessment. The 2016 criteria are developed using the best available science and reflect data for 75 new species and 49 new genera. Table 2 shows the magnitude, frequency and duration of the cadmium criteria CNMI adopted.

Table 2. 2016 Aquatic Life Ambient Water Quality Criteria for Cadmium

	Acute (1-hour, dissolved Cd)[c]	Chronic (4-day, dissolved Cd)
Freshwater (Total Hardness = 100 mg/L as $CaCO_3$)[a]	1.8 µg/L[b]	0.72 µg/L
Estuarine/marine	33 µg/L	7.9 µg/L

[a] Freshwater acute and chronic criteria are hardness-dependent and were normalized to a hardness of 100 mg/L as $CaCO_3$ to allow the presentation of representative criteria values.

[b] Lowered to protect a commercially and recreationally important species (rainbow trout), as per the 1985 Guidelines, Stephen et al. (1985).

[c] The duration of the 2016 acute criteria was changed to 1-hour to reflect the 1985 Guidelines-based recommended acute duration.

C. Selenium

Selenium is a naturally occurring element present in sedimentary rocks, shales, coal and phosphate deposits and soils. There are around 40 known selenium-containing minerals but all are rare and generally occur together with sulfides of metals such as copper, zinc and lead. Selenium can be released into water resources by natural sources via weathering and by anthropogenic sources, such as surface mining, coal-fired power plants, and irrigated agriculture. Selenium is a nutritionally essential element for animals in small amounts, but toxic at higher concentrations. Selenium bioaccumulates in the aquatic food chain and chronic exposure in fish and aquatic invertebrates can cause reproductive impairments. Selenium can also adversely affect juvenile growth and mortality (USEPA, 2016). None of the monitoring data for any of the permitted dischargers on CNMI reveal any effluent levels of selenium.

CNMI BECQ adopted EPA's 2016 national recommended ambient water quality criteria for selenium, which applies to freshwater waterbodies. The 2016 criterion reflects the latest scientific knowledge, which indicates that selenium toxicity to aquatic life is primarily based on organisms consuming selenium-contaminated food rather than by being exposed only to selenium dissolved in water. The final criterion is expressed both in terms of fish tissue concentration (egg/overy, whole body, muscle) and water concentration (lentic, lotic). While more than half the available chornic studies were fish studies, available field data and laboratory toxicity studies suggest that a criterion based on fish will protect amphibians, aquatic invertebrates, and plants since these taxa appear to be less sensitive to selenium than fish. Table 3 shows the magnitude, frequency, and duration of the 2016 criterion compared to the previous 1999 criteria.

Table 3. Comparison of 2016 Selenium Criterion to 1999 Criteria

	Chronic					Short-term
Criterion Version	Egg-Ovary[1] [mg/kg dw]	Whole body[1] [mg/kg dw]	Muscle[1] [mg/kg dw]	Water Lentic[1] [μg/L]	Water Lotic[1] [μg/L]	Water[1] [μg/L]
2016	15.1	8.5	11.3	1.5 (30 day)	3.1 (30 day)	Intermittent exposure equation
1999	N/A	N/A	N/A	5 (4 day)	5 (4 day)	Acute equation based on water column concentration

[1] A note on hierarchy of table: when fish egg/ovary concentrations are measured, the values supersede any whole-body, muscle, or water column elements except in certain situations. Whole body or muscle measurements supersede any water column element when both fish tissue and water concentrations are measured, except in certain situations. Water column values are derived from the egg & ovary concentrations via bioaccumulation modeling. Water column values are the applicable criterion element in the absence of fish tissue measurements, such as waters where fish have been extirpated or where physical habitat and/or flow regime cannot sustain fish populations, or in waters with new discharges of selenium where steady state has not been achieved between water and fish tissue at the site.

D. Previously Adopted Standards

Acrolein, carbaryl, diazinon, nonylphenol and tributyltin water quality standards were approved by EPA in 2015, but ESA consultation has not been completed.

Acrolein: Acrolein is primarily used as an intermediate in the synthesis of acrylic acid and as a biocide. It may be formed from the breakdown of certain pollutants in outdoor air or from the burning of organic matter including tobacco, or fuels such as gasoline or oil. Chronic effects include respiratory congestion and eye, nose, and throat irritation. There is no current use of acrolein on CNMI and there is no import of acrolein to CNMI (Watts, 2015; Personal Communication with Zabrina Shai, BECQ Pesticide Inspector Aug 21, 2018).

Carbaryl: Carbaryl is a member of the N-methyl carbamate class of pesticides, which share a common mechanism of toxicity by affecting the nervous system in animals. Carbaryl also affects plant development and is used to thin fruit in orchards. Carbaryl (Sevin®) is a pesticide used to control insects, slugs and snails and to thin fruit in orchards. It can enter water bodies through runoff and potentially pose risks to aquatic life. Carbaryl is the second most frequently found insecticide in water, with detections in approximately half of monitored urban streams. After contact with or ingestion by aquatic organisms, the toxic mode of action of carbaryl is inhibition of the enzyme acetylcholinesterase (AChE) at synaptic junctions in the nervous system. AChE breaks down the neurotransmitter acetylcholine. Inhibition of AChE results in the accumulation of acetylcholine in the nerve synapses which leads to continual firing of nerve pulses throughout the nervous system. This buildup results in uncontrolled movement, paralysis, convulsions, tetany, and possible death. Without proper nerve function, the respiratory, circulatory and other vital body systems will fail, ultimately causing death of the organism. The acetylcholinesterase inhibition effects of carbaryl are reversible with removal of exposure of the stressor chemical.

Diazinon: Diazinon is a pesticide traditionally used throughout the U.S. to control insects in agricultural areas, households and urban settings. Diazinon is mobile and moderately persistent in the environment. Diazinon is frequently found in wastewater treatment plant effluent and storm water runoff in urban and agricultural areas. Diazinon is known to be toxic to aquatic life, particularly invertebrates.

After December 31, 2004, it became unlawful to sell diazinon for outdoor, non-agricultural uses in the United States (that is, all residential uses of the insecticide diazinon have been cancelled). However, it is lawful to use diazinon for non-residential or agricultural uses that are consistent with product labeling and precautions approved by EPA under the Federal Insecticide, Fungicide and Rodenticide Act. There is no current use of diazinon on CNMI and there is no import of diazinon to CNMI (Watts, 2015; Personal Communication with Zabrina Shai, BECQ Pesticide Inspector Aug 21, 2018).

Nonylphenol: There is little direct use for nonylphenol except as a mixture with diisobutyl phthalate to color fuel oil for taxation purposes and with acylation to produce oxime as an agent to extract copper. Most nonylphenol is used as an intermediate in the production of other chemicals. Notably, nonionic surfactants of the nonylphenol ethoxylate type are produced through etherification of nonylphenol by condensation with ethylene oxide in the presence of a basic catalyst. The nonionic surfactants are used as oil soluble detergents and emulsifiers that can be sulfonated or phosphorylated to produce anionic detergents, lubricants, antistatic agents, high performance textile scouring agents, emulsifiers for agrichemicals, antioxidants for rubber manufacture, and lubricant oil additives.

Nonylphenol is metabolized by hepatic cytochrome P450 enzymes in the rainbow trout and bile from the fish contained the glucuronic acid conjugates of nonylphenol. Moderate bioaccumulation in aquatic organisms may be expected (USEPA, 2005). A comprehensive literature search in 1999 along with 43 newer studies were used along with U.S. EPA Office of Pollution Prevention and Toxics risk assessment data and analysis to derive the aquatic life criteria for nonylphenol. The acute and chronic criterion are listed in Table 4.

Tributyltin: Tributyltin (TBT) is primarily used as a biocide in antifouling paints. It is toxic to aquatic life and is an endocrine disrupting chemical that causes severe reproductive effects in aquatic organisms. TBT has been measured in the water column and found highly (70-90%) associated with the dissolved phase but TBT readily adsorbs to sediments and suspended solids where it may persist (USEPA, 2003). The nationally recommended criteria are designed to protect aquatic organisms and water quality uses. The acute and chronic criterion are listed in Table 4.

Table 4. Acute and Chronic Criteria for Nonylphenol and Tributyltin

Pollutant	Saltwater CMC[1] (acute) (µg/L)	Saltwater CCC[2] (chronic) (µg/L)	Freshwater CMC[1] (acute) (µg/L)	Freshwater CCC[2] (chronic) (µg/L)
Acrolein	N/A	N/A	3	3
Carbaryl	1.6	N/A	2.1	2.1
Diazinon	0.82	0.82	0.17	0.17
Nonylphenol	7	1.7	28	6.6
Tributyltin	0.42	0.0074	0.46	0.072

[1] CMC: Criterion Maximum Concentration
[2] CCC: Criterion Continuous Concentration

None of the monitoring data for any of the permitted dischargers on CNMI reveal any effluent levels for acrolein, carbaryl, diazinon, nonylphenol or tributyltin. The duration and frequency of the acute criteria is a one-hour average concentration not to be exceeded more than once every three years and a four-day average concentration not to be exceeded more than once every three years for chronic criterion.

III. Description of the Area Affected

The CNMI water quality standards apply to all commonwealth or state waters. Pursuant to Chapter 65-130 of CNMI's WQS, commonwealth or state waters includes all waters, fresh, brackish, or marine, including wetlands, surrounding or within the commonwealth. The aquatic life criteria apply to all freshwater or saltwater, whichever is appropriate. The acute and chronic toxicity standards apply to all commonwealth or state waters.

IV. Listed Species

EPA received an official species list from the USFWS on April 11, 2018 and is shown in Table 5.

Table 5. USFWS Threatened and Endangered Species List for CNMI

Common Name	**Scientific Name**	**Status**	**Critical Habitat**	**Carried Forward**
Bat, Mariana fruit (=Mariana flying fox)	Pteropus mariannus mariannus	Threatened	No	No
Bat, Pacific sheath-tailed (Mariana subspecies)	Emballonura semicaudata rotensis	Endangered	No	No
Crow, Mariana (=aga)	Corvus kubaryi	Endangered	Yes	No

Kingfisher, Guam	Todiramphus cinnamominus	Endangered	No	No
Megapode, Micronesian	Megapodius laperouse	Endangered	No	No
Moorhen, Mariana common	Gallinula chloropus guami	Endangered	No	Yes
Rail, Guam	Rallus owstoni	Endangered	No	No
Swiftlet, Mariana gray	Aerodramus vanikorensis bartschi	Endangered	No	No
Warbler, nightingale reed (old world warbler)	Acrocephalus luscinia	Endangered	No	Yes
White-eye, Rota bridled	Zosterops rotensis	Endangered	No	No
Sea turtle, green	Chelonia mydas		No	Yes
Sea turtle, hawksbill	Eretmochelys imbricata		No	Yes
Skink, Slevin's	Emoia slevini	Endangered	No	No
Snail, fragile tree	Samoana fragilis	Endangered	No	Yes
Snail, Guam tree	Partula radiolata	Endangered	No	Yes
Snail, humped tree	Partula gibba	Endangered	No	Yes
Snail, Langford's tree	Partula langfordi	Endangered	No	Yes
Butterfly, Mariana eight-spot	Hypolimnas octocula marianensis	Endangered	No	No
Butterfly, Mariana wandering	Vagrans egistina	Endangered	No	No
Damselfly, Rota blue	Ischnura luta	Endangered	No	Yes
Siboyas halumtanu	Bulbophyllum guamense	Threatened	No	No
No common name	Dendrobium guamense	Threatened	No	No
Ufa halumtanu	Heritiera longipetiolata	Endangered	No	No
No common name	Nervilia jacksoniae	Threatened	No	No
No common name	Nesogenes rotensis	Endangered	No	No
No common name	Osmoxylon mariannense	Endangered	No	No
Aplokating palaoan	Psychotria malaspinae	Endangered	No	No
Iagu, Hayun (=(Guam), Tronkon guafi (Rota))	Serianthes nelsonii	Endangered	No	No
Biringenas halumtanu	Solanum guamense	Endangered	No	No
No common name	Tabernaemontana rotensis	Threatened	No	No
No common name	Tinospora homosepala	Endangered	No	No
No common name	Tuberolabium guamense	Threatened	No	No
Fadang	Cycas micronesica	Threatened	No	No

The plant species will not be the focus of this consultation. These plants are considered terrestrial, none of which are considered aquatic or aquatic-dependent.

V. Anticipated Effects

The EPA approval of the ammonia, cadmium, and selenium water quality standards may have effects when CNMI permits are implemented. Cadmium and selenium are not currently being discharged from any of the permitted facilities in CNMI. The quantity of ammonia effluent discharged from the facilities is much lower than the concentration limits allowed in the permits. The effects determinations are grouped and summarized below and the supporting information and specific rationales are also provided for each species. USFWS shares jurisdiction of Chelonia mydas and Eretmochelys imbricata with NMFS.

No effect was determined for species which were not aquatic or aquatic dependent, and species that did not occur or have critical habitat in the project area:

Plants: *Bulbophyllum guamense, Dendrobium guamense, Heritiera longipetiolata, Nervilia jacksoniae, Nesogenes rotensis, Osmoxylon mariannense, Psychotria malaspinae, Serianthes nelsonii, Solanum guamense, Tabernaemontana rotensis, Tinospora homosepala, Tuberolabium guamense, Cycas micronesica*

Insects: *Hypolimnas octocula marianensis, Vagrans egistina*

Mammals: *Pteropus mariannus mariannus, Emballonura semicaudata rotensis*

Reptile: *Emoia slevini*

Bird species: *Todiramphus cinnamominus, Corvus kubaryi, Megapodius laperouse, Rallus owstoni, Aerodramus vanikorensis bartschi, Zosterops rotensis*

Not Likely to Adversely Affect was determined for the remaining species: *Gallinula chloropus guami, Acrocephalus luscinia, Chelonia mydas, Eretmochelys imbricate, Samoana fragilis, Partula radiolata, Partula gibba, Partula langfordi* and *Ischnura luta.*

A. Mariana common moorhen (*Gallinula chloropus guami*)

The Mariana common moorhen inhabits freshwater lakes, marshes, swamps, and man-made as well as natural wetlands. Guam biologists have observed that moorhens often stay near vegetation bordering the water because it acts as an escape cover. The moorhen feeds on both plant and animal matter in or near the water including grass, adult insects, and insect larvae. The largest threat facing the Mariana common moorhen is disappearing suitable wetland habitat due to extensive human use and the spread of undesirable vegetation (USFWS, 1991).

B. Nightingale reed warbler (*Acrocephalus luscinia*)

On Saipan, the warbler is found in thicket-meadow mosaics, forest edge, reed marshes, and forest openings. On Pagan, the warbler inhabits freshwater wetland and wetland edge vegetation almost exclusively. Data on the warbler's foraging habits is limited but have been observed to eat insects, larvae, lizards, snails and spiders. Threats to the warbler include habitat destruction, volcanism, and introduced predators and competitors (USFWS, 1998).

NLTAA Rationale for Birds:

Ammonia: The few studies available on the effects of ammonia to birds focus on the inhalation of atmospheric ammonia in poultry. The moorhen and warbler will not be exposed to significant atmospheric ammonia concentration levels. Poultry have been exposed to concentrations between 50-100 ppm, or even up to 200 ppm, because of reduced ventilation in commercial poultry houses (Carlile, 1984). These levels of exposure can cause irritation to the mucous membranes in the eyes and respiratory system, increase susceptibility to respiratory diseases, and affect food intake and growth rate (Kristensen and Wathes, 2000). The current suggested level of ammonia not to be exceeded is 25 ppm based on human health rather than animal welfare. Poultry can develop a variety of disorders when exposed to ammonia levels at 20 ppm for long periods of time.

The national ammonia criteria for water is 17 mg/L for acute and 1.9 mg/L chronic and is expected to be protective of birds because these levels are lower than the values shown to have impacts. Because the moorhen and warbler diets consist of both animal and plant matter, and particularly terrestrial organisms for warblers, there is limited exposure through ingestion. The UK Marine Special Areas of Conservation reported that birds are unlikely to be affected directly by ammonia toxicity.

Cadmium: Toxicity studies have not been performed on the Mariana common moorhen, Nightingale reed warbler, or any type of moorhen or warbler. As a result, the data gathered from a study of the lesser scaup and greater scaup populations that examined the effects of cadmium, mercury, selenium and corticosterone on pair status and male reproductive indices will be used to understand the impacts of cadmium and selenium. The geometric mean concentration of cadmium in the ducks was 9.20 μg/g (range 0.78 to 93.6) and for selenium was 4.33 μg/g (range 2.12 to 12.72) (Pollock and Machin, 2008).

While cadmium can alter testicular function and suppress the production and secretion of testosterone, cadmium concentrations at the high end of 93.6 μg/g were still below concentrations shown to cause altered testicular function or morphology in birds (Pollock and Machin, 2008). Another study showed that the kidneys of mallard ducks fed 2 and 20 mg/L cadmium in their diet were relatively unaffected after 90 days, but ducks that were fed 200 mg/L cadmium had slight to severe kidney lesions after 60 days (White et al, 1977). The amount of cadmium shown to have an effect in mallard kidneys is well above the national criteria set by EPA of 1.8 μg/L (acute) and 33 μg/L (chronic). There were no significant lesions found on mallard testes from the mallards that fed on a 2 mg/L cadmium diet, and only a few birds that were fed a 20 mg/L cadmium diet showed slight to moderate gonad alterations. The testes of mallards fed 200 mg/L diets had atrophied and the spermatogenic process had ceased after 90 days. Again, the concentrations at which cadmium affected mallard testes were well above the national criteria set by EPA. Background level of cadmium concentrations in waterfowl is 7 μg/g (Puls, 1994) and 100 μg/g is considered the threshold for major toxic effects (Furness, 1996). The national cadmium criteria are expected to be protective of the bird species.

Selenium: Toxicity studies have not been performed on the Mariana common moorhen, Nightingale reed warbler, or any type of moorhen or warbler. As a result, the data gathered from a study of the lesser scaup and greater scaup populations that examined the effects of cadmium, mercury, selenium and corticosterone on pair status and male reproductive indices will be used to understand the impacts of cadmium and selenium. The geometric mean concentration of selenium in the ducks was 4.33 μg/g (range 2.12 to 12.72) (Pollock and Machin, 2008).

The mean concentration of selenium (4.33 μg/g) did not show any significant correlation to impacts on scaup reproductive indices. No significant correlation existed between impacts and the selenium concentration levels of up to 12.72 μg/g found in ducks. The national selenium criteria are 8.5 mg/kg for whole body and 11.3 mg/kg for muscle concentration in fish tissue. The national selenium criteria are expected to be protective of bird species given the concentration limits placed on the fish and the concentrations at which no significant impacts were observed on the birds.

Acrolein: EPA concludes that there will be no effect of diazinon on birds in relation to this action because the CNMI BECQ pesticide office confirmed that there is no reported use or import of diazinon on the islands (Shai, 2018). Information has been included for background information: Acute oral toxicity and repellency of acrolein to Redwinged blackbirds and Starlings occurred at 10 mg/kg (Schafer et al, 1983). The median LD_{50} value for acrolein on birds is 5.25 mg/kg (Ware, 2001). The national criteria for acrolein is 3 μg/L for both acute and chronic conditions. The national criteria are expected to be protective of birds because these levels are below any of the concentrations shown to have a toxic effect on birds.

Carbaryl: Hybrid red-legged partridges given malathion or carbaryl alone, via oral administration of 200 mg/kg, showed no visible signs of toxicity (Johnston et al, 1994). However, carbaryl was lethal to 4 out of 12 birds when the birds were pretreated with malathion. Acute oral toxicity and repellency of carbaryl to Redwinged blackbirds occurred at 56.2 mg/kg (Schafer et al, 1983). The median LD_{50} value for carbaryl on birds is 1870.50 mg/kg (Ware, 2001). The EPA national criteria for carbaryl is 2.1 μg/L for both acute and chronic conditions. The national criteria are expected to be protective of birds because these levels are below any of the concentrations shown to have a toxic effect on birds.

Diazinon: EPA concludes that there will be no effect of diazinon on birds in relation to this action because the CNMI BECQ pesticide office confirmed that there is no reported use or import of diazinon on the islands (Shai, 2018). Information has been included for background information: Acute oral toxicity and repellency of diazinon occurred at 2.0 to 3.16 mg/kg for Redwinged blackbirds, 110-316 mg/kg for Starlings, and 4.22 mg/kg for Coturnix quails (Schafer et al, 1983). The median LD_{50} value for diazinon on birds is 14.06 mg/kg (Ware, 2001). The EPA national criteria for diazinon is 0.17 μg/L for both acute and chronic conditions. The national criteria are expected to be protective of birds because these levels are below any of the concentrations shown to have a toxic effect on birds.

Nonylphenol: Most of the current studies use embryo injection to deliver nonylphenol into egg yolk or egg white to investigate its effect on the development of sexual organs. One study put 4-

nonylphenol (4-NP) in drinking water to investigate more realistic exposure conditions and effects of nonylphenol on Japanese quail reproductive ability (Cheng et al, 2017). Quails were administered various doses in their drinking water (0.1 μg/L, 1.0 μg/L, 10 μg/L, and 100 μg/L) for 18 weeks. The 4-NP had no significant impact on food intake, egg production, eggshell thickness, or broken egg rates. Quail groups exposed to 10 μg/L experienced adverse effect on body weight. There was a significant difference in fertilization rate between the control group and the group exposed to 10 μg/L or more. There was a significant difference in hatchability of quails between the control group and the group exposed to 10 μg/L or more. There was moderately negative correlation between treatment dose and 14 day survival rate and reduced spermatogenesis in seminiferous tubules at the 1.0 μg/L treatment dose.

Seabirds in Morro Bay, California were found to have 15,700 +/- 3,600 ng/g nonylphenol in the liver (Diehl, 2012). A wild duck in Switzerland had nonylphenol concentrations of 1.20 mg/kg in muscle tissue, 0.10 mg/kg in the liver, 0.54 mg/kg in the stomach, <0.3 mg/kg in the heart, and 0.19 mg/kg in the brain (Ahel, 1993). Hu et al. 2005 found no trophic magnification for 4-NP in the aquatic food web of their study. Staniszewska et al. 2014 found that the process of nonylphenol removal takes precedence over the process of accumulation in tissues and organs of birds. High concentrations of nonylphenol were found in guano of herring gulls compared with concentrations found in fish. Despite the limited data available, the national criteria for nonylphenol is expected to be protective of birds because the effect levels from the existing literature exceed the values set in the national criteria.

Tributyltin (TBT): The effects of tributyltin on birds has not been well studied. Because no data is available on the impacts of TBT to moorhens and warblers, a study on the occurrence of butyltin compounds (monobutyltin, dibutyltin, tributyltin) in the tissue of water birds and ducks in the U.S. and Canada will be used to assess the impacts of TBT on birds. Butyltin concentrations in the liver of coastal birds in the U.S. ranged from 7-84 ng/g (Kannan et al, 1998).

Waterfowl that feed primarily on bivalve mollusks, such as mussels, accumulate greater concentrations of butyltins than predatory birds that feed on fish, other birds or small mammals. The common moorhen feeds on plant and animal matter such as grass, insects, snails, and algae. The warbler feeds predominantly on terrestrial organisms such as lizards, spiders, insects and snails. Because bioaccumulation of TBT through the food chain is the main exposure pathway of TBT to birds, these birds have more limited exposure to TBT due to the nature of their non-aquatic diet.

Butyltin concentrations were greater in the ventral feathers of mallard ducks than in their livers. The feathers of cormorants contained 20-30% of the total burden of butyltins in the body (Guruge et al, 1996). Seasonal molting of feathers can be a natural detoxification mechanism, which could result in less accumulation of butyltins in birds than in other aquatic animals. Based on the limited data available on the impacts of TBT to birds, the national TBT criteria is expected to be protective of the warbler and moorhen due to the nature of their diet, molting of their feathers, and the manner in which the criteria is meant to be protective of the most sensitive freshwater organisms.

C. Green turtle (*Chelonia mydas*)

Green turtles primarily inhabit open ocean convergence zones, beaches for nesting, and coastal areas for benthic feeding. Hatchlings swim from beaches to offshore areas where they live for several years. Once juveniles reach a certain age, they leave the pelagic habitat and travel to nearshore foraging grounds. The adult diet consists of seagrasses and algae. The largest threat to green turtles is the long-term harvest of eggs and adults on nesting beaches and juveniles and adults on feeding grounds. Other threats include incidental capture in fishing gear and a disease called fibropapillomatosis.

D. Hawksbill turtle (Eretmochelys imbricata)

Hatchlings inhabit the pelagic environment and feed at the surface. After a few years, juveniles forage in coastal areas and feed on animals associated with the coral reef environments. The diet consists of algae, sponges, and other invertebrates. In addition to coral reef environments, hawsbills are found around rocky outcrops, high-energy shoals, mangrove-fringed bays, and estuaries. The primary threat to hawksbills is habitat loss of coral reef communities. Coral reefs are vulnerable to destruction by human activities and global climate change. Hawksbills are harvested for their eggs and meat and for commercial exploitation. Increased recreational and commercial use of nesting beaches and incidental capture in fishing gear are additional threats.

NLTAA Rationale for Turtles: The effects analysis for turtles was completed for all saltwater water quality standards, which include cadmium, carbaryl, diazinon, nonylphenol, and tributyltin, because these standards apply to turtle habitat. The freshwater water quality standards, which include ammonia, selenium and acrolein, were not included in the effects analysis because they do not apply to turtle habitat.

Cadmium: Ingestion is thought to be the biggest route (Storelli et al.,2005, Ikonomopoulou et al., 2011). Green turtles are largely herbivorous. Leatherback feed almost exclusively on jellyfish and loggerhead turtles are carnivorous. Leatherback turtles accumulated higher levels of cadmium as jellyfish are high in cadmium (Caurant et al.,1999). Cadmium is eliminated quickly from turtle blood and stored in the liver where it binds with metallothionein and is eventually stored in the kidney (Guirlet and Das, 2012). Concentrations in Green sea turtle eggs near Hong Kong are low (Lam et al., 2006). Maternal transfer of cadmium to turtle eggs is low (Paez-Osúna et al.,2010, Ikonomopoulou et al., 2011, Sakai et al., 2000, Storelli et al.,2005). EPA finds that the cadmium standards are not likely to adversely affect any of the threatened or endangered turtles.

Carbaryl: Aguirre et al. 1994 analyzed the shell and tissue of Green Sea turtle hatchlings from the Hawaiian Islands for a number of chemical contaminants. Carbaryl was not detected at concentrations above the detection limit of 100 ug/l. de Solla and Martin (2011) evaluated the uptake of carbaryl on snapping turtle (*Chelydra serpentina*) exposed to soil with carbaryl at the agronomic rate. There was no uptake in the eggs after 8 days of exposure. At ten times the agronomic rate there was uptake after 1 day.

Hopkins et al., 2005 found that carbaryl concentrations of 5,000 ug/l affected the swimming performance of neonate black swamp snakes (*Seminatrix pygaea*) and diamondback water snakes (*Nerodia rhombifer*). Most individuals recovered from the effects of carbaryl on swimming performance within 96 hours. As discussed above carbaryl is not expected to bioconcentrate to a significant extent. EPAs' research has not found any thresholds in the Ecotox database or in the scientific literature that are less than either the acute criteria of 1.6 ug/l. EPA finds that the carbaryl standards are not likely to adversely affect any of the turtles.

Diazinon: There is no information on turtles in the EPA criteria document or the Ecotox database. One report from the open literature suggested that diazinon was not present at detectable levels (10 ug/l) in the shell and tissue of Green Sea turtle hatchlings from the Hawaiian Islands (Aguirre et al 1994). The Ecotox database contained at least 14 papers on diazinon and birds, and most were based on incidental consuming of crystals by birds or studies where diazinon was force fed (gavage). Lacking lethal dose information on turtles and reptiles, we used bird information as a surrogate species. The mallard duck has an oral dose LD_{50} of 1.44 mg/kg ((EFSA, 2006b, as reported in Crane et al., 2016) and can be used as a surrogate to assess the effect of trophic uptake by sea turtles. Assuming the bioconcentration factor of 213 for the sheepshead minnow (*C variegatus*) and assuming the acute diazinon criterion value of 0.82 ug/l we calculate a diazinon prey value of less than 0.175 mg/kg, an order of magnitude lower than the LD_{50} for the mallard. Using this as a first order approximation, we conclude that sea turtles are not likely to get much diazinon from its prey species. EPA finds that the diazinon standards are not likely to adversely affect any of the turtles.

Nonylphenol: While sea turtles are immersed in seawater, contaminants like 4-nonylphenol do not readily pass through their shell and skin into the body. Unlike gilled species, sea turtle exposures are not continuous because they do not drink continuously. Indirect exposures can occur through ingestion of food that has accumulated pollutants. In the Mediterranean Sea, Guerranti et al., 2014 reported that p-nonylphenol levels in the green sea turtle and the loggerhead sea turtle were only slightly higher than the limits of detection. They noted that this may be the first report of nonylphenols in sea turtles in the scientific literature.

The Ecotox database does not include data on reptiles exposed to 4-nonylphenol, so studies from the open literature were used in this assessment. The induction of vitellogenin in response to nonylphenol, impairment of spermatogenesis, and gonad abnormalities were reported in the Italian wall lizard exposed to drinking water dosed at 500,000 ug/l nonylphenol (Verderame et al 2010; Verderame and Limatola 2015).

Cheng et al. 2017 demonstrated that the fertilization rates in Japanese quail were significant at concentrations as low as 0.1 ug/l; Survival rates were reduced with long term (4 to 14 day) exposure to nonylphenol at 1 ug/l. NMFS cited Cheng et al., 2017 Biological Opinion on Environmental Protection Agency's Approval of Florida's Proposed Water Quality Criteria for 4-Nonyphenol and determined that the nonylphenol standard would not adversely affect sea turtles.

Tributyltin (TBT): There is no information in the Ecotox database on TBT in turtles. Our literature search found one paper on TBT in turtles. TBT was not detected in turtle eggs of *Natator depressus* in Australia (Ikonomopoulou et al, 2011). EPAs' research has not found any thresholds in the Ecotox database or in the scientific literature that are less than either the acute (0.0074 ug/l) or chronic (0.42 ug/l) tributyltin standards. EPA finds that the tributyltin standards are not likely to adversely affect any of the turtles.

E. Tree Snails

Fragile tree snail (*Samoana fragilis*)

The fragile tree snail is a tree-dwelling species known to inhabit the forest ecosystems of Rota. The small population is continuing to decline due to habitat loss and destruction from agriculture, urban development, nonnative animals and plants, and typhoons. Climate change is expected to exacerbate existing threats. Shell trading and predation by rats and flatworms also contribute to population decline (USFWS, 2015).

Guam tree snail (*Partula radiolata*)

The Guam tree snail is endemic to the forest ecosystem of Guam and occur in several populations on CNMI. Habitat destruction and predation by the manokwari flatworm are significant threats to the species (USFWS, 2015).

Humped tree snail (*Partula gibba*)

Endemic to the forest ecosystem, humped tree snails are more mobile during higher ambient humidity and precipitation and less mobile during dry periods. They live on bushes or trees and feed primarily on dead or decaying plant material. The snail occurs in cool, shaded forest habitats with high humidity and reduced air movement that prevents excessive water loss. The population is in decline and threatened by habitat loss and predation by nonnative species (USFWS, 2015).

Langford's tree snail (*Partula langfordi*)

Endemic to the forest ecosystem of Aguiguan, the Langford's tree snail has not been observed in the wild since 1992 when one live individual was observed on the island. Surveys in 2006 and 2008 revealed only shells of dead Langford's tree snails. Given that so few surveys have been conducted on Aguiguan, it is possible that Langford's tree snails may be found. The largest threat to Langford's tree snails are habitat loss and degradation by nonnative animals, development, predation by nonnative animals, and loss of genetic representation (USFWS, 2015).

NLTAA Rationale for Snails: During correspondence regarding a different ESA consultation for tree snails in American Samoa, general information regarding Pacific Island tree snails was exchanged via email correspondence between EPA, USFWS, and a former National Park Service field ecologist staff. EPA requested technical assistance from USFWS regarding the effect of ammonia water quality standards in American Samoa on tree snails. The information obtained from the technical assistance regarding tree snails is useful information that is applicable to the tree snails in CNMI. Therefore, the information from the technical assistance is included below.

Tree snails are generally found in trees 5-15 feet off the ground and get their water exposure from rain rather than surface water. In American Samoa, streams in even remote locations often have periodic contamination of ammonia loads because of feral pig activity. These water quality issues did not directly affect American Samoa's two snail endangered species – Tutuila Tree Snail (*Eua zebrina*) and Sisi snail (*Ostodes strigatus*) (Brown and Browning, 2017).

Land snails do not require contact with rivers, streams, or puddles. Instead they rely on the microhabitat they are found in such as semi-moist areas with frequent rain showers, drip fog, or cloud forests. Tutuila tree snails can exist in riparian areas but do not interact with the aquatic or fresh water ecosystems. Because tree snails do not require interaction with marine or fresh water ecosystems for food or habitat, the exposure to contaminants in aquatic ecosystems is extremely limited and very unlikely. Most land snails have a diet that can include leaves, stems, soft bark, fruit, vegetables, fungi and algae.

Ammonia: Additional protection is afforded to terrestrial snails because EPA's 2013 nationally recommended criteria for ammonia considered data for several sensitive freshwater mussel species in the Family Unionidae and freshwater non-pulmonate (gill-bearing) snails. The criteria is fully protective of these aquatic snails. Since no toxicity data is available for the species specific to CNMI, the freshwater mussel and non-pulmonate snails, which share the same Mollusca phylum as CNMI's terrestrial snails, will be used as surrogates to understand the impacts of ammonia to the snails. The criteria are based on a sensitivity distribution comprised of ranked genus mean acute values (GMAVs), calculated from combined species mean acute values (SMAVs) within each genus for acceptable data. SMAVs are calculated using the geometric mean for all acceptable measures of effect based on the results of toxicity tests within a given species (e.g. all EC_{50}s from acceptable acute tests for *Daphnia magna*). The most sensitive mussel was the Green Floater with a SMAV of 23.41 mg TAN/L, while the most sensitive snail was the Pagoda hornsnail with a SMAV of 68.54 mg TAN/L. The criteria is set at 17mg TAN/L, which is lower than the SMAV of the most sensitive aquatic snail (USEPA, 2013).

Cadmium: The acute criteria for cadmium incorporated toxicity data for the snail species (*Aplexa hypnorum*), which has a SMAV of 204.1 µg/L. The freshwater mussels Neosho mucket (*Lampsilis rafinesqueana*), *Lampsilis straminea claibornensis*, and *Lampsilis siliquoidea* have SMAV values of 44.67 µg/L, 93.17 µg/L, and 35.73 µg/L, respectively, all of which are an order of magnitude higher than the acute cadmium criteria value of 1.8 µg/L (USEPA, 2016).

Selenium: Toxicity studies that were collected when creating the national selenium criteria show that invertebrates are relatively insensitive to selenium compared to fish. Therefore, the fish whole-body concentration limits in the criteria are expected to be generally protective of invertebrates as well as fish. Snail, Asian clam, and Zebra mussel information was included in the analysis of the selenium criterion (USEPA, 2016).

Acrolein: EPA concludes that there will be no effect of acrolein on snails in relation to this action because the CNMI BECQ pesticide office confirmed that there is no reported use or import of acrolein on the islands (Shai, 2018). Information has been included for background information: Laboratory studies indicate that snail immersion in solution of 10 mg/L acrolein for 3 hours or 2.5 to 5 mg/L acrolein for 24 hours is lethal. Exposure to concentrations below these levels for the same duration had some effect but snails made full recovery once moved back to freshwater solution (Ferguson et al, 1961). The EPA national acrolein criteria is 3 µg/L for acute and chronic exposure. The national criteria are expected to be protective of snails because these levels are below any of the concentrations shown to have a toxic effect on snails.

Carbaryl: The 96-h LC_{50} value of carbaryl was 14.6 µg/mL for the snail *Pomacea patula* (Mora et al, 2000). The 24-h and 96-h LC_{50} values of carbaryl were 20.05 mg/L and 14.19 mg/L, respectively for the freshwater snail *Lymnaea acuminate* (Srivastava and Singh, 2001). Fecundity of *Lymnaea acuminate* was reduced at the 11.00 mg/L concentration of carbaryl (Singh and Agarwal, 1986). The EPA national criteria for carbaryl is 2.1 µg/L for both acute and chronic conditions. The national criteria are expected to be protective of snails because these levels are below any of the concentrations shown to have toxic effects on snails.

Diazinon: EPA concludes that there will be no effect of diazinon on snails in relation to this action because the CNMI BECQ pesticide office confirmed that there is no reported use or import of diazinon on the islands (Shai, 2018). Information has been included for background information. Laboratory tests indicate that the LC_{50} values for the 4-h and 96-hour exposure times were 93 mg/L and 11 mg/L, respectively for the freshwater snail *Gillia altilis*. These values are greater than the LC_{50} values for bluegill and rainbow trout. The bioconcentration of diazinon in freshwater fish is 5 to 10 fold greater than levels in snails (Robertson and Mazzella, 1989). The LC_{50} value of *Biomphalaria alexandrina* snails to diazinon is 3.10 mg/L (Bakry et al, 2016). The EPA national diazinon criteria is 0.17 µg/L for acute and chronic exposure. The national criteria are expected to be protective of snails because these levels are below any concentrations shown to have toxic effects on snails.

Nonylphenol: Since no toxicity data is available for the specific species to CNMI, toxicity data for the snail, *Pysella virgata,* will be used as a surrogate. Toxicity data for *Pysella virgata* was used in creating the national criteria for nonylphenol and showed acute toxicity to nonylphenol at concentration 774 µg/L. This is well above the national criterion at 28 µg/L (USEPA, 2005).

Tributyltin (TBT): Since no toxicity data is available for the species specific to CNMI, toxicity data for the snail, *Nucella lapillus*, of the same Gastropoda class as the tree snails will be used as a surrogate. Toxicity data for the *Nucella lapillus* was used in setting the tributyltin national criteria. Acute toxicity of TBT to the *Nucella lapillus* occurred at 72.7 µg/L and chronic toxicity occurred at 0.0143 µg/L. These levels are above the national criteria at 0.42 µg/L and 0.0074 µg/L. The freshwater clam had an acute value of 24,600 µg/L, which is well above the 0.46 µg/L acute value for freshwater (USEPA, 2003).

F. Rota blue damselfly (*Ischnura luta*)

The Rota blue damselfly is endemic to the island of Rota and known only to exist in the freshwater streams of the Talakhaya watershed. The primary source of the Rota blue damselfly stream habitat is spring water emerging at the limestone-basalt interface below the highly permeable limestone of the Sabana plateau (USFWS, 2015). This spring also serves as the main source of fresh water supply for the population of Rota. The Talakhaya watershed is remote and relatively inaccessible, so the damselfly is largely protected from human impact.

Adults feed on small flying insects such as midges and other flies. Adults have only been observed in association with a single perennial stream on Rota, so it is believed that the larval stage is aquatic, like most other damselfly species. The immature larval life stage of the damselfly is the only aquatic life stage where they breathe through flattened abdominal gills and feed on small aquatic organisms. Threats to the damselfly would include a reduction or removal of stream flow due to increased interception for municipal usage or from the effects of climate change. Introduction of nonnative fish into the stream could also wipe out the damselfly population. The population is vulnerable due to the low number of individuals and lack of genetic representation.

NLTAA Rationale for Insects: The Rota blue damselfly's habitat is afforded some protection from human impact by its remote and relatively inaccessible location. Because of the remote and inaccessible nature of the damselfly's habitat and stream's natural source of spring water, the damselfly is very unlikely to be exposed to the surface water pollutants. There are no wastewater dischargers on the island of Rota, which further limits the chances of pollutant exposure to the damselfly.

Ammonia: Additional protection is afforded to the Rota blue damselfly because toxicity test data (mortality, immobility, loss of equilibrium) for aquatic insects was incorporated into EPA's 2013 nationally recommended criteria for ammonia. The damselfly (*Enallagma* sp.), reviewed in toxicity tests, is of the same order Odonata as the Rota blue damselfly and had a SMAV of 164.0 mg TAN/L which is well above the nationally recommended criteria of 17 mg TAN/L.

Cadmium: EPA considered but did not ultimately include LC50 values for damselfly (*Enallagma sp.*) when creating the cadmium criteria because the pH was made to be artificially low as part of the study. LC50 values for the unused studies were 7,050 μg/L, 8,660 μg/L, and 10,660 μg/L at pH levels of 3.5, 4.0, and 4.5 respectively. These LC50 values are well above the acute criteria at 1.8 μg/L and chronic criteria of 0.72 μg/L.

Selenium: Toxicity studies that were collected when creating the national selenium criteria show that invertebrates are relatively insensitive to selenium compared to fish. Therefore, the fish whole-body concentration limits in the criteria are expected to be generally protective of invertebrates as well as fish. Dragonfly, damselfly, mayfly and midge information was included in the analysis of the selenium criterion.

Tributyltin (TBT): Since no toxicity data is available for the damselfly, toxicity data for mosquito larva will be used as a surrogate to understand the impacts of TBT. The mosquito larva toxicity data was considered in setting the national criteria. Mosquito larva showed acute toxicity at a concentration of 10.2 μg/L. This value is well above the national criteria set at 0.46 μg/L.

Nonylphenol: Since no toxicity data is available for the damselfly, toxicity data for the midge and dragonfly nymph will be used as surrogates to understand the impacts of nonylphenol. The midge (2nd instar), *Chironomus tentans*, showed acute toxicity to nonylphenol at concentration 160 μg/L. The dragonfly (nymph), *Ophiogomphus* sp., showed acute toxicity at concentration 596 μg/L. Both of these values were considered in setting the national acute criterion at 28 μg/L, which is meant to be protective of the most sensitive species *Hyalella azteca*. The midge

(*Chironomus tentans*) showed chronic toxicity at concentration 61.82 μg/L. This information was used in setting the national chronic criterion at 6.6 μg/L.

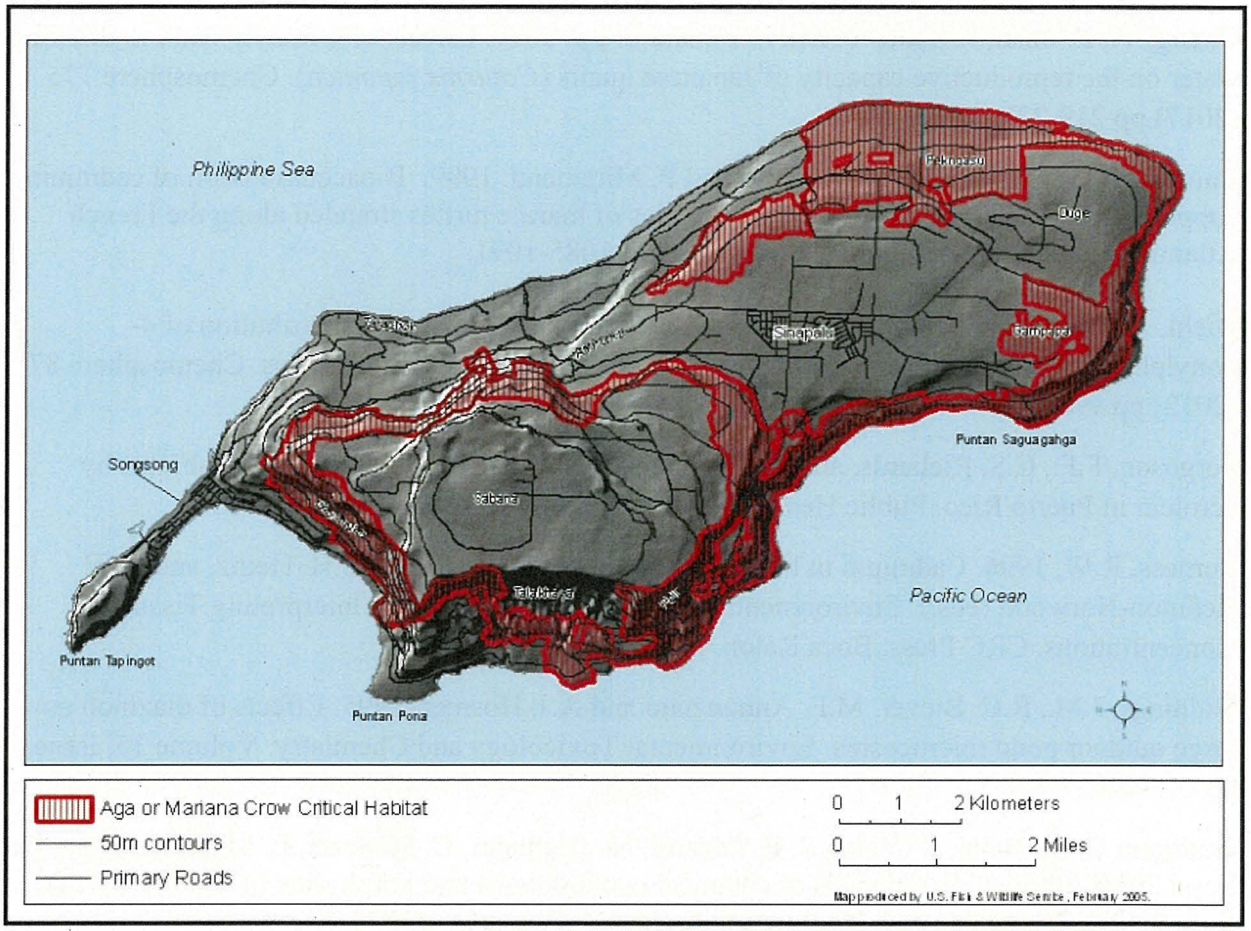
Carbaryl: In one laboratory experiment, damselfly larvae were exposed to carbaryl until the adult damselflies merged. The highest concentration which did not affect emergence was 10 ppb (Hardersen and Wratten, 1998). The LC_{50} values for *Cinygma* sp. (mayflies) are 848 μg/L, 220 μg/L, and 165 μg/L for 15, 30, and 60 minute exposure times respectively. *Calineuria californica* (stonefly) did not have 50% mortality rates after 15 or 30 minute exposure intervals. After 60 minutes of exposure, the stonefly had an LC_{50} value of 1,139 μg/L (Peterson and Jepson, 2009). The EPA national carbaryl criteria is 2.1 μg/L for acute and chronic exposures. The national criteria are expected to be protective of insects because these levels are below any of the concentrations shown to have lethal effect on insects.

Acrolein: EPA concludes that there will be no effect of acrolein on damselflies in relation to this action because the CNMI BECQ pesticide office confirmed that there is no reported use or import of acrolein on the islands (Shai, 2018). Information has been included for background information: The National Biological Survey reports that insects are comparatively resistant to acrolein compared to other animals. Adult fruitflies (*Drosophila melanogaster*) tolerated 3,700,00 μg Acrolein/L in culture medium (U.S. DOI, 1994). An EPA study on the toxicity of pesticides to water fleas determined that the maximum acceptable acrolein concentration for *Daphnia magna* is between 16.9 to 33.6 μg/L. The 48-h EC_{50} for *Daphnia magna* is 0.051 mg/L. The 48-h LC_{50} for midges is 0.151 mg/L (Holcombe et al, 1987). The EPA national acrolein criteria is 3 μg/L for acute and chronic exposure. The national criteria are expected to be protective of insects because these levels are below any of the concentrations shown to have a lethal effect on insects.

Diazinon: EPA concludes that there will be no effect of diazinon on damselflies in relation to this action because the CNMI BECQ pesticide office confirmed that there is no reported use or import of diazinon on the islands (Shai, 2018). Information has been included for background information: The LC_{50} value of diazinon to the damselfly *Lestes congener* is 50 μg/L. In a simulated aquatic field study, Odonates were not significantly reduced even at the highest exposure level (70-d average concentration 443 μg/L) (Giddings et al, 1995). The EPA national diazinon criteria is 0.17 μg/L for acute and chronic exposure. The national criteria are expected to be protective of insects because these levels are far below any of the concentrations shown to have any effect on insects.

VI. Critical Habitat

Figure 1. Designated Critical Habitat for Aga, Island of Rota, Commonwealth of the Northern Mariana Islands.



Critical habitat for the Mariana Crow was designated on Rota in 2004 (USFWS, 2005). For the aga, approximately 2,552 hectares (6,033 acres) were designated on Rota (Figure 1). EPA's action will have no effect on designated Critical Habitat for the Mariana Crow because the designated critical habitat for this species is not aquatic habitat, and the proposed action is unlikely to result in any alteration of these critical habitat areas that would result in the adverse modification of the critical habitat.

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